Let A C (Fig. 6) be the width of the groin arch, and D B its height. Join A B, and divide it into the same number of parts as C B in Fig. 5 ; and draw through the points 1, 2, 3, 4 the lines D 1, D 2, D 3, D 4. Then from A draw a line perpendicular to A C, and transfer to it the divisions from the corresponding line in Fig. 5 ; and from these divisions draw lines to B. The intersection of these lines with the lines D 1, D 2, etc., will give points through which the curve may be traced.

To draw an ogee arch.—Divide the width A B (Fig. 7) into four equal parts in *d, c, e ;* and on *d, e* erect the square *d, f, g, e.* The points *d, e, f, g,* are the centres of the four quadrants A *k, k l,* B *h, h l,* composing the arch.

Another Method.—Let A C (Fig. 8) be the width and D B the height of the arch. Join A B, B C, and bisect the lines in *e, f ;* then from the centres, A, *e,* B, *f,* C, with the radius A *e* or *e* B, describe the arcs intersecting in the points *g, h, k, l,* which are the centres of the four arcs composing the ogee arch.

Another Method.—When the arch is equilateral. Bisect A B (Fig. 9) in C, join A *h,* B *h.* From C, with the radius A or B, describe the arcs A *d,* B *e ;* then, to find the centres of the other arcs, from the points *d, e,* and *h* as centres, and with the same radius as before, describe arcs intersecting each other in the points *f* and *g,* which are the centres of the arcs *h d, h e.*

Lessons in Projection.

BY ROBERT RIDDELL, TEACHER OF THE ARTISAN CLASS IN THE HIGH SCHOOL, PHILADELPHIA, PA.

Projection of Straight Lines and Curves.—Let A (Fig. 1, Plate 39) be the given plan, and B C the angle of projection. Draw perpendiculars through the plan, cutting B C. The distances thus given on the angle are transferred to the line C D, from which trace the different members that are to project and intersect with those of plan A.

The elliptical curve K R is obtained by finding two foci as N L, in which fix two pins as shown ; then with a piece of thread and a pencil strike the curve the usual way ; this curve, when in position, will be found to stand directly over the quarter circle shown on plan A. This principle of obtaining a curve is precisely the same as for finding the section of a cylinder when cut by a plane not parallel with the base.

To understand and form correct ideas of complex problems of this kind, there is no better way than by making a drawing of each one on card-board, and then cutting it at the lines so that it will fold up to the desired shape. If the cut parts do not come freely together without twisting or buckling, there will be some error in the constructive principle which can generally be speedily rectified. It will be seen that by adapting this method of testing problems many serious mistakes may be avoided.

In the problem before us the lines to be cut are marked with crosses, and the bases of these cut parts are marked *o, o, o.* Now let us take that part marked B *x x x x,* and raise it on the folding line *o o* until it is perpendicular with the plan A. Then take the part D K, R S, and C, and fold over at the base line *o o* until it lays on the inclining line B C ; it will be seen then that the work is correct, as the lines on D will stand perpendicularly over the corresponding lines on the plan A.

The parts S S should be removed, as by doing so a better idea of the working of the problem will be obtained.

The method of teaching projection by cutting cardboard has many advantages over all other modes of instruction ; in fact, it is a workshop operation, as the pupil sees before him a model of the work, and is thereby better able to proceed with the work when putting it in actual practice.

The Sectorian System of Hand-Railing.

FIFTH PAPER.

FIG. 1 (Section 1, Plate 34) in this example shows the ground plan of platform stairs, with one half the landing and ascending treads placed in the platform. The cylinder is of larger size than is generally used for this kind of stairs, and I give this example to show that as easy and as graceful a wreath can be thrown around this as any of smaller size.

Fig. 2 is the lower piece of wreath with a part of straight rail attached. The sections of rail at each end show the direction given by the spring and plumb bevels, which are the same. The bevel, Fig. 6, astride the tangents of this figure shows the angle as obtained on the sector, Fig. 3, which, when folded to an angle of ninety degrees and each blade placed on the line, shows the pitch of half a riser from the chord line to the centre of the cylinder. The angle is obtained, as shown, for getting the tangents of one half the wreath, one mould answering for both pieces by reversing the end. The shank may extend as far as the thickness of stuff will allow.

Fig. 3 is the sector with the line showing the rise, and the horizontal lines, giving the height of half a riser.

Fig. 4 is the shape of the outside falling mould, and is obtained by getting the stretch-out of convex side of wreath from face of the

two platform risers around that portion of circle on the platform ; draw a line the length of stretch-out, which in this example is two and a half feet ; at the ends of this line set up and down a half riser, and draw a chord, cutting right line in the centre ; then set up and down a flyer, and connect at A and B ; extend the rake of the flyers and connect at C, D on the right line—this gives angles for making easements by intersecting lines ; after which set off for top and bottom lines the thickness of rail. The inside falling mould is obtained in the same manner. When the slabs are taken from the convex and concave sides of the wreath which gives the twist, then apply these moulds, centre to centre with wreath. If the stuff is scant, they may be raised or lowered parallel with centres ; and when made secure, kerf in with a hand-saw to the edges of the moulds and remove the surplus wood, and you have the top and bottom twist without the use of gauges or guess work, and as the plate shows, without the piece being wider in one place than another and no thicker than the width of the rail, and always sawed square from the face of the plank.

On Section 2 of the same plate is shown a stairs with winders, starting below the chord line and landing at the quarter circle. In some situations the space may not be of sufficient width to allow a large cylinder in the turning, and contraction has to take place somewhere. The steps are as narrow as convenience will allow, and the landing above, the same. The winders must have sufficient width to receive, without crowding, the balusters ; hence the necessity of making one part of the cylinder larger than the other, and the upper landing as laid down on this plate.

As before stated, all the lines are the centres, and as Fig. 1 has only one line, and a part of the elevation Fig. 2 the same, of course the width and thickness must be set off each way from this line. The steps are shown half their length, and the tread ten inches wide.

The plan is so plain that a further description is deemed unnecessary. The newel at No. 2 shows the height from the floor by adding the length of a short balluster to the shaft.

The elevation shows the stretch-out of the winders in the wreath, the ramp at the newel, and also at the beginning of the winders.

Fig. 3 is the lower wreath piece, with bevels and twist marked, and needs no further explanation.

Fig. 4 is the upper wreath piece, and is procured in the same way.

Figs. 5 and 6 are the convex and concave falling moulds.

The chord lines A and B, Figs. 5 and 6, are the stretch-out of the wreath, Fig. 4, at A and B, and shows the length of the convex and concave falling moulds. They are drawn to rise half a riser above the floor, so as to admit a long balluster on the landing above. To obtain the falling mould, draw lines on the rake and upper level, intersecting at C, Fig. 5 ; then take the stretch-out A, Fig. 4, and apply it at Fig. 5 ; then square down from rake and level, to intersect at D, then from this point draw the curve and width, and you have the convex, and by the process shown at Fig. 6 you have the concave moulds for the upper ramp.

Hand-Railing.

GEO. W. LONGSTAFF.

PLATE C shows a method of laying down the rail for a flight of circular stairs. Fig. 1 shows the plan of cylinder with risers cutting round the centre of rail and tangents ; the joints are located at A, B, C, and D, making four pieces ; the two wreaths from A to C are alike, and only one mould is required.

The rail is one pitch from E to A. Fig. 2 shows the elevation of steps and risers for first wreath, and Fig. 3 the landing wreath ; these are drawn in the same manner as shown in previous plates, making the width of treads correspond with the points where the risers cut the tangents in Fig. 1 ; these elevations also give the exact height as shown ; the first wreath, Fig. 2, is lifted for the newel, and the landing wreath, Fig. 3, runs half a rise above the floor ; the wreaths A B and B C simply rise four risers, and are drawn as shown in Fig. 1. Figs. 4, 5, and 6 show the face moulds and application of the bevels.

Correspondence.

WE invite communications from our readers in matters connected with the trades we represent. Be brief, courteous, and to the point.

Editor of Wood-Worker :

I FULLY agree with "Apprentice" in his tirade against guess-workers ; we have too many "rule o' thumb" mechanics in this country, and if our Mississippi friend and the Newark guesser would stick to rules and proper methods, they would find in the end that their work would be speedier and better done. It is science and good practical knowledge mechanics want, not guess-work rules.

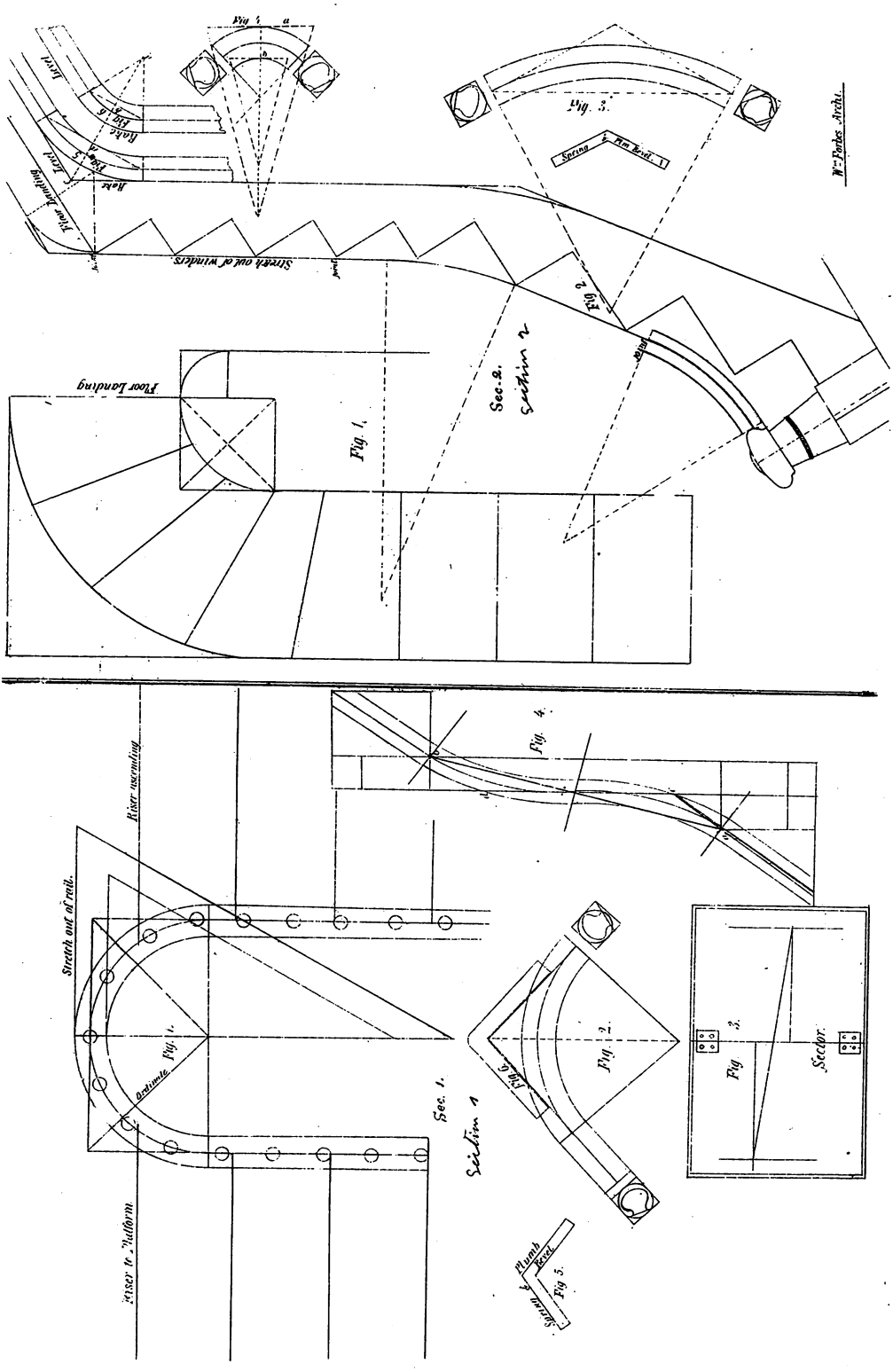
R. M. G.

JOHNSTOWN, Pa., April 17, 1879.

Editor of Wood-Worker :

I AM very much pleased with the ILLUSTRATED WOOD-WORKER, and feel sure that if it maintains its present high standard it will be a success in every sense of the word.

PLATE 34



THE SECTORIAN SYSTEM OF HAND-RAILING